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22. DETAILED ANALYSIS OF ALTERNATIVES

The remedial alternatives retained in the initial screening (see Section 21) are further evaluated in this detailed analysis that evaluates remedial alternatives against the CERCLA criteria. Results of this analysis will form the basis for future activities such as identification of preferred alternatives for the sites and preparation of the WAG 10 comprehensive proposed plan. Subsequent to appropriate reviews of the RI/FS and the proposed plan and comment resolution, the detailed analysis will support the final selection of remedial actions for WAG 10 sites and preparation of the ROD.

22.1 Introduction

The detailed analysis assesses remedial action alternatives for seven of the nine CERCLA evaluation criteria that can be addressed before public comment (40 CFR 300.430; EPA 1988). The nine criteria are divided into three categories: threshold, balancing, and modifying. The first two criteria (overall protection of human health and the environment, and compliance with ARARs are classified as threshold criteria. A remedial action must satisfy these two criteria in the detailed analysis to be a candidate preferred alternative. The next five criteria, used to weigh major tradeoffs among alternatives, are classified as balancing criteria. The five balancing criteria are long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. The last two criteria, classified as the modifying criteria, are state acceptance and community acceptance. The modifying criteria are used to address the acceptability of remedial alternatives to stakeholders. Remedial alternatives will be evaluated against the two modifying criteria after the WAG 10 comprehensive RI/FS and proposed plan have been reviewed by the public and comments have been resolved.

The intent of this analysis is to present sufficient relevant information to allow DOE-ID, the EPA, and the IDEQ, with input from the public to select appropriate remedies. Evaluation against all nine criteria, including public and state acceptance, is the basis for determining the ability of a remedial action alternative to satisfy CERCLA remedy selection requirements.

The detailed analysis is conducted in two distinct phases. In the first phase, the alternatives are assessed individually against the evaluation criteria. In the second phase, the results of the individual analyses are then used in a relative or comparative analysis. This second analysis identifies advantages and disadvantages of the alternatives relative to one another so that the key tradeoffs that decision-makers must balance can be identified.

A description of each of the nine evaluation criteria outlined in the NCP (40 CFR 300.430[e][9][iii]) and EPA guidance (EPA 1988) is presented below.

22.1.1 Overall Protection of Human Health and the Environment

The remedial action alternatives are assessed to determine whether they adequately protect human health and the environment, in both the short and long term, from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at a site by eliminating, reducing, or controlling exposures to levels established during the development of remediation goals consistent with the NCP. Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

22.1.2 Compliance with ARARs

The remedial action alternatives are assessed to determine whether they either meet ARARs under federal environmental laws and state environmental or facility siting laws or provide grounds for invoking one of the waivers provided in the NCP. In addition, "to be considered" items (TBCs) are evaluated under this criterion.

22.1.3 Long-Term Effectiveness and Permanence

The remedial action alternatives are assessed for long-term effectiveness and permanence, along with the degree of certainty that the alternative would prove successful. Factors that are considered, as appropriate, include the following:

- **Magnitude of residual risk remaining from untreated waste or treatment residuals at the conclusion of the remedial activities.** The extent that residual contamination remains hazardous, taking volume, toxicity, mobility, and propensity to bioaccumulate into account, should be considered.

- **Adequacy and reliability of measures such as containment systems and institutional controls that are necessary to manage treatment of residuals and untreated waste.** This factor addresses, in particular, the uncertainties associated with land disposal for providing long-term protection from residual contamination; the assessment of the potential need to replace technical components of the alternative, such as a cap, slurry wall, or treatment system; and the potential exposure pathways and risks posed should the remedial action need replacement.

22.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

The degree to which the remedial action alternatives employ recycling or treatment that reduces toxicity, mobility, or volume is assessed, including how the treatment addresses the principal threats posed by a site. Factors that may be considered include (a) the treatment or recycling processes that the alternatives employ and the materials they will treat; (b) the amount of hazardous substances, pollutants, or contaminants that will be destroyed or recycled; (c) the degree of expected reduction in toxicity, mobility, or volume of the waste because of the treatment or recycling and the specification of which reductions are occurring; (d) the degree to which the treatment is irreversible; (e) the types and quantities of residual contamination that will remain following treatment, taking into consideration the persistence, toxicity, mobility, and propensity to bioaccumulate; and (f) the degree to which treatment reduces the inherent hazards posed by the principal threats at the site.

22.1.5 Short-Term Effectiveness

The short-term impacts of the implementation period for each of the alternatives are assessed considering (a) the short-term risks that might be posed to the community during implementation of an alternative, (b) the potential impacts to workers during remedial action and the effectiveness and reliability of protective measures during implementation, (c) the potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation, and (d) the time until protection is achieved.

22.1.6 Implementability

The ease or difficulty of implementing the remedial action alternatives is assessed by considering the following types of factors, as appropriate: (a) technical feasibility including the technical difficulties and unknowns associated with the construction and operation of the technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy; (b) administrative feasibility including the activities required to coordinate with other offices and agencies and the ability and time needed to obtain any necessary approvals and permits; and (c) availability of services and materials including the availability of adequate treatment, storage capacity, disposal capacity and services, necessary equipment and specialists, availability of prospective technologies, and any necessary additional resources.

22.1.7 Cost

Cost estimates are developed for the remedial action alternatives for comparison purposes only and are not intended for budgetary, planning, or funding purposes. Estimates have an estimated range of accuracy of +50 to -30%, in accordance with EPA guidance for conducting feasibility studies under CERCLA (EPA 1988). The general methodology, assumptions, and derivations of alternative cost estimates are provided in Appendix I. The types of costs assessed include (a) management and oversight costs, which would be incurred primarily by the INEEL Environmental Restoration Program; (b) cleanup costs, including construction management and oversight, remedial design/remedial action (RD/RA) document preparation, and reporting costs; (c) remedial design costs; (d) construction costs including general and administrative and construction subcontract fees; (e) operations costs; and (f) surveillance and monitoring costs. All initial and future life-cycle costs are normalized to represent present worth. Present worth is the cumulative worth of all costs, as of the beginning of the first year of activities, accounting for inflation of future costs. Present worth costs are estimated assuming variable annual inflation factors for the first 10 years, in accordance with DOE Order 430.1, followed by a constant 5% annual inflation rate. A constant 5% discount rate is assumed. Note that "present worth" is referred to as the "net present value" in the Summary Cost Estimate Sheets provided in Appendix I.

Total project cost in fiscal year 2001 dollars and costs in escalated dollars are presented in Appendix I. The assumptions used to develop cost estimates also are presented. Total project cost in fiscal year 2001 dollars is the cost of performing all of the work in 2001, without any inflation of costs for future work, while the escalated dollar estimate is the cost of performing all of the work, accounting for inflation but without discounting to present worth.

Note that in all cases the "construction subcontract" costs (i.e., the actual costs of construction) are much less than the present worth. Management and oversight, both by the INEEL Maintenance and Operations contractor and the construction subcontractor, account for a significant fraction of the total present worth in some cases. One hundred years of maintenance, surveillance, and monitoring also become a significant part of the present worth for those alternatives incorporating long-term maintenance and monitoring.

22.1.8 State Acceptance

Remedial action alternatives are not evaluated in accordance with state acceptance during the detailed analysis. However, IDEQ concerns about the WAG 10 comprehensive RI/FS will be resolved before the WAG 10 comprehensive proposed plan is issued for public comment. Representatives from IDEQ are active in the development and evaluation of remedial alternatives in the RI/FS. The proposed plan and ROD for WAG 10 will be developed through consensus by DOE-ID, EPA, and IDEQ participants.

22.1.9 Community Acceptance

The assessment of community acceptance includes determining which components of the remedial action alternatives interested persons in the community support, have reservations about, or oppose. The assessment will be completed through comments on the WAG 10 comprehensive proposed plan.

Alternatives are not evaluated in accordance with community acceptance during the detailed analysis. In accordance with EPA guidance for conducting FSs under CERCLA (EPA 1988), community acceptance will be evaluated following comment on the RI/FS report and the proposed plan. The criterion will be addressed during selection of a remedy and while the ROD is being prepared (EPA 1988).

22.2 Individual Analysis of Alternatives

In accordance with EPA guidance (EPA 1988), remedial action alternatives retained for detailed analysis were individually assessed in the FS against the evaluation criteria listed above, not including state and community acceptance. The individual analysis of each alternative against the two threshold criteria and five balancing criteria is presented in the following subsections.

22.2.1 TNT/RDX Contaminated Soils

22.2.1.1 Alternative 1: No Action. The no action alternative provides a baseline against which other alternatives can be compared. This alternative consists of soil, air, and groundwater monitoring to assess conditions at WAG 10 TNT/RDX soil sites. For this FS and to meet the intent of the NCP, we assume that under the no action alternative, the sites could become immediately accessible to the general public.

22.2.1.1.1 Overall Protection of Human Health and the Environment—Under the no action alternative, human health and ecological risks at WAG 10 TNT/RDX contaminated soil sites would be the same as those identified in the BRA (see Section 21) for the current occupational scenario and greater than the risks estimated for the 100-year future residential scenario. The BRA identifies risks in excess of 1E-04 in the 100-year future residential scenario from ingestion of homegrown produce, dermal adsorption of soil, ingestion of soil, and ingestion of groundwater. The absence of controls for contaminated soils results in no reduction in risks other than by natural biological degradation. The RAOs would not be satisfied because risks to human and ecological receptors would not be reduced.

22.2.1.1.2 Compliance with ARARs and TBCs—The evaluation of the no action alternative for compliance with ARARs and with TBCs is presented in Table 22-1. The no action alternative would not inhibit releases to groundwater, and therefore, this action does not satisfy the Idaho Administrative Procedures Act groundwater ARAR.

The no action alternative would not meet the DOD 6055.9-STD DoD Ammunition and Explosives Safety Standards, Chapter 12 "Real Property Contaminated with Ammunition, Explosives, or Chemical Agents," TBCs, because no methods would be implemented to protect workers and members of the general public from exposure to hazards.

22.2.1.1.3 Reduction of Toxicity, Mobility, or Volume Through Treatment—No treatment is associated with this alternative.

Table 22-1. Evaluation of compliance with ARARs and TBCs for WAG 10 TNT/RDX contaminated soil sites, Alternative 1: No Action.

ARAR or TBC	Type	Citation	Met Evaluation[a]
Idaho Groundwater Quality Rule	Chemical	IDAPA 58.01.11.200 Groundwater Quality Standards	No
Real Property Contaminated with Ammunition, Explosives, or Chemical Agents	TBC	DoD Standard 6055.9, Chapter 12	No

a. A yes in the Met Evaluation column indicates that the alternative meets the ARAR or TBC.

22.2.1.1.4 Short-Term Effectiveness—The evaluation of the no action alternative incorporates the assumption that sites would be immediately available to the general public. An institutional control period is not considered. Because the no action alternative does not include mitigative measures to address risks to residential receptors, and immediate access is postulated, short-term risks are greater than those estimated in the BRA for the 100-year future residential scenario. Therefore, the short-term effectiveness for the no action alternative is low.

22.2.1.1.5 Implementability—No specialized equipment, personnel, or services are required to implement the no action alternative. This alternative can be implemented immediately without additional risks to the community, workers, or the environment.

22.2.1.1.6 Cost—The estimated costs, $3.5 million, for the no action alternative for WAG 10 TNT/RDX contaminated soil sites are summarized in Table 21-1 and presented in detail in Appendix I. Postclosure cost estimates include the full duration of the 100-year period of monitoring.

22.2.1.2 Alternatives 3a and 3b: Removal, Treatment of TNT/RDX Fragments, and Disposal of Soil. Alternatives 3a and 3b differ only in the final disposal location of the contaminated soils. The on-Site CFA landfill was considered for cost estimation purposes for Alternative 3a, although the proposed ICDF could also be used for disposal. A private disposal facility located off the INEEL would be used for Alternative 3b. The representative facility off the INEEL considered for evaluation in this FS for cost-estimating purposes is Waste Management Northwest landfill in Arlington, Oregon. The seven CERCLA screening criteria (EPA 1988) are considered to be the same for both alternatives with the exception of the additional transportation costs and potentially larger disposal costs.

Alternatives 3a and 3b would involve the following:

- UXO survey and removal if required
- Characterization of soil for TNT and RDX contamination
- Excavating soils with contaminant concentrations in excess of PRGs
- Verification sampling
- Segregation of TNT and RDX fragments followed by detonation at the Mass Detonation Area

- Soil transport for on-Site or off-Site disposal
- Site restoration
- Institutional controls and long-term environmental monitoring.

The UXO surveys and removal, if required, would be performed using standard military techniques. Soils would be characterized and excavated either manually or mechanically, as permitted by safety analysis. The TNT and RDX fragments would be segregated from the soil and detonated at the Mass Detonation Area. Contaminated soil would then be disposed at an approved on-Site (Alternative 3a) or off-Site (Alternative 3b) facility. Verification sampling would be performed to confirm soils above the PRGs were removed. The sites would be restored in accordance with the INEEL revegetation procedures. Institutional controls and long-term environmental monitoring would be implemented because buried, undetected TNT and RDX fragments may still exist after remediation, which could come to the surface in the future through frost heave and erosion and present an unacceptable risk.

22.2.1.2.1 Overall Protection of Human Health and the Environment—Alternatives 3a and 3b provide effective, long-term protection of human health and the environment. The removal of all detected ordnance, TNT and RDX fragments, and contaminated soil from WAG 10 sites of concern would minimize potential long-term human health and environmental concerns associated with future exposure to, or contaminant migration from, uncontrolled release sites. Detonation of any ordnance and the TNT and RDX fragments will effectively destroy the material. Both the INEEL site and the off-Site disposal facility would provide isolation of the contaminated soil (a) within a controlled area in which waste management controls are in place and (b) for at least the period of institutional control. Institutional controls would still be maintained to limit access and future activity at the sites and monitoring would be performed because there is the potential for buried, undetected UXO, TNT, and RDX to reach the surface from frost heaves and erosion, thereby posing an unacceptable risk.

Alternatives 3a and 3b also are protective of the environment during implementation because mitigative measures to prevent contaminant migration during excavation activities would be implemented. However, short-term protection of human health is less effective because workers would be exposed to health hazards from the TNT and RDX contamination and safety hazards from potential UXO during excavation. However, all potential risks during implementation could be controlled through administrative and engineering controls. Waste generated during remedial actions would consist of only relatively small quantities of equipment decontamination fluids and discarded personal protective equipment.

22.2.1.2.2 Compliance with ARARs—The evaluation of Alternatives 3a and 3b for compliance with ARARs and TBCs is presented in Table 22-2. Available data indicate the soils should contain less than 1% (10,000 ppm) TNT and RDX when excavated, and hence, the soil will not be considered hazardous and can be sent to an industrial waste landfill. This will be confirmed during remediation. Removal and detonation of UXO, TNT, and RDX fragments complies with the Military Munitions Rule and the Open Burning, Wastes Explosives provisions of the RCRA. Groundwater ARARs would be met by removal of TNT and RDX as well as continued monitoring. Compliance with the emission control ARARs would be ensured by implementing air monitoring and dust suppression techniques during excavation. The DOD Standard 6055.9, Chapter 12 "Real Property Contaminated with

Table 22-2. Evaluation of compliance with ARARs and TBCs for WAG 10 TNT/RDX contaminated soil sites: Alternative 3a, removal, treatment of TNT/RDX fragments, and disposal of soil on the INEEL, and Alternative 3b, removal, treatment of TNT/RDX fragments, and disposal of soil off the INEEL.

ARAR or TBC	Type	Citation	Met Evaluation[a]
Idaho Groundwater Quality Rule	Chemical	IDAPA 58.01.11.200 Groundwater Quality Standards	Yes
Military Munitions Rule	Action	40 Code of Federal Regulation 266, Subpart M	Yes
Rules for Control of Air Pollution in Idaho	Action	IDAPA 58.01.01.650-.651, Fugitive Dust	Yes
Rules and Standards for hazardous Waste in Idaho	Action	IDAPA 58.01.05.008, which incorporates RCRA by reference	Yes
Rules and Standards for Hazardous Waste in Idaho	Action	IDAPA 58.01.05.009 (40 Code of Federal Regulations 265.382)	Yes
Native American Graves Protection and Repatriation Act	Location	25 USC 32	Yes
National Historic Preservation Act	Location	36 Code of Federal Regulations 800	Yes
Real Property Contaminated with Munition, Explosives, or Chemical Agents	TBC	DoD Standard 6055.9, Chapter 12	Yes

a. A yes in the Met Evaluation column indicates that the alternative meets the ARAR or TBC.

Ammunition, Explosives, or Chemical Agents," would be met by implementing and enforcing applicable provisions of the standard and rule. All areas affected by WAG 10 remedial activities would be evaluated for cultural resource concerns before disturbance. Activities in sensitive areas would be modified, as required, to meet ARARs. The two alternatives are, therefore, capable of complying with ARARs and TBCs.

22.2.1.2.3 Long-Term Effectiveness—Alternatives 3a and 3b would achieve long-term protection because all detected soil contamination at levels above PRGs would be removed from WAG 10 and transferred to a managed waste disposal facility, either the CFA landfill, proposed ICDF, or an off-Site facility such as Waste Management Northwest. Institutional controls would be maintained at the site and monitoring would be performed because there is the potential for any buried, undetected TNT and RDX fragments to eventually reach the surface due to frost heaves and erosion. Therefore, long-term effectiveness and permanence for Alternatives 3a and 3b is classified as high.

22.2.1.2.4 Reduction of Toxicity, Mobility, or Volume Through Treatment—Segregation of the TNT and RDX fragments for subsequent detonation will result in some reduction of toxicity and volume of these site contaminants. However, no treatment of the contaminated soils is associated with this alternative.

22.2.1.2.5 Short-Term Effectiveness—The exposure risks to workers during excavation and removal of UXO, TNT and RDX fragments, and contaminated soil at WAG 10 sites could be significant. However, use of appropriate equipment and personal protective equipment, air monitoring, and dust control measures have been demonstrated to effectively mitigate risks in previous INEEL removal actions. Short-term effectiveness is, therefore, considered moderate. Worker exposure to soils contaminated with toxic and energetic materials would be inhibited using standard protective measures.

If mechanical excavation and screening equipment are used, it would be modified to minimize potential for explosion and prevent injury to workers in the event of an explosion. Inhalation and ingestion risks caused by toxic compounds in soil could be minimized by use of appropriate personal protective equipment, engineering controls, and adherence to health and safety protocols.

In addition to risks caused by exposure to contaminants, risks associated with the physical construction hazards such as vehicle accidents or personal injury can be minimized by implementation of appropriate health and safety measures for earth-moving construction activities.

Environmental impacts resulting from Alternatives 3a and 3b would depend on the methods allowed for removal of TNT and RDX fragments and contaminated soil. Minimal impact would result if only manual excavation was used. Much larger areas would be disturbed if mechanical equipment was used for soil excavation and sorting to remove the TNT and RDX fragments. However, the impacts of these activities would be temporary and the sites would be restored to match the surrounding landscape at the completion of the project. Sensitive cultural resources exist at WAG 10 contaminated soil sites of concern. Assessments, including Native American consultation, would be conducted at all sites before any disturbance. In the event that cultural resources are discovered, an assessment will be made of the effects of the remedial action on the resource, and options to mitigate adverse impacts will be determined and evaluated. Appropriate actions will be taken to comply with ARARs that protect cultural resources.

RAOs would be achieved by Alternatives 3a and 3b once excavation and disposal at the CFA landfill, proposed ICDF, or off-Site facility are complete. To satisfy the RAOs during implementation of these alternatives, exposure to UXO and contaminated soils would have to be mitigated to acceptable risks through administrative and engineering controls.

The removal of soils from all WAG 10 soil sites of concern could be achieved in less than 12 months. However, the estimated time to prepare environmental assessments, safety analysis, and design phases, as well as performing the removal and verification sampling, is 12 to 18 months.

22.2.1.2.6 Implementability—Alternatives 3a and 3b are easily implementable. Equipment for UXO detection and removal are currently available. The equipment and labor to manually or mechanically excavate the soil and segregate the TNT and RDX fragments are also available. Characterization, packaging, transportation, and disposal of UXO, TNT and RDX fragments, and contaminated soils all use available technologies. The trained personnel and specialized equipment required would be available.

22.2.1.2.7 Cost—The estimated cost for the conventional excavation and disposal alternatives is low. Cost estimates are based on the use and operation of excavation equipment and disposal. Cost allowances are used to account for air pollution controls, monitoring equipment and analyses, waste characterization, packaging, and continuing institutional controls. For Alternative 3b, costs for transport to Waste Management Northwest are included. The estimated costs for Alternatives 3a and 3b, $4.3 million and $4.4 million, respectively, are summarized in Table 21-1 and presented in detail in Appendix I.

22.2.1.3 Alternatives 4a and 4b: Removal, Ex Situ Treatment, and Disposal or Return to Excavation. Alternatives 4a and 4b only differ in the treatment method and disposition of the contaminated soils; the actions for detection and removal of UXO, soil excavation, segregation and detonation of TNT and RDX fragments, site restoration, and postremedial action institutional controls and monitoring would be the same as described under Alternatives 3a and 3b. Off-Site incineration and disposal is considered in Alternative 4a while on-Site composting with return of the treated soils to the excavations is addressed in Alternative 4b. The evaluation of the seven CERCLA screening criteria are

basically the same for both alternatives with the exception of the additional transportation, treatment, and disposal costs associated with off-Site treatment and disposal.

Alternatives 4a and 4b would involve the following:

- UXO survey and removal if required.
- Characterizing the soil for TNT and RDX contamination.
- Excavating all soils with contaminant concentrations in excess of PRGs and separating the TNT and RDX fragments.
- On-Site detonation of the TNT and RDX fragments.
- Ex situ treatment and disposition of contaminated soils. For Alternative 4a the soil would be transported to an off-Site incinerator for treatment and disposal. For Alternative 4b the soil would be treated on-Site by composting, and the treated soil would be returned to the excavation sites.
- Verification sampling.
- Site restoration.
- Institutional controls and long-term environmental monitoring.

Detection and removal of UXO, soil excavation, separation and detonation of TNT and RDX fragments, verification sampling, site restoration, institutional controls and long-term environmental monitoring would be performed as previously described. For Alternative 4a, the contaminated soils would be transported to an off-Site incinerator for treatment. For cost estimating purposes, the Onyx Environmental Services Treatment Complex in Port Arthur, Texas, was selected as the representative off-Site incineration and disposal facility. For Alternative 4b, the contaminated soils would be composted on-Site. The treated soils would then be returned to the excavations.

22.2.1.3.1 Overall Protection of Human Health and the Environment—Alternatives 4a and 4b provide effective, long-term protection of human health and the environment. The removal and detonation of the TNT and RDX fragments, and the removal of soil with unacceptable human health and ecological risk, followed by treatment, and disposal in a secure landfill or return to the excavation site minimize potential long-term human health and environmental concerns. These alternatives also are environmentally protective during implementation because mitigative measures to prevent contaminant migration during excavation activities would be implemented.

22.2.1.3.2 Compliance with ARARs—The evaluation of Alternatives 4a and 4b for compliance with ARARs and TBCs is presented in Table 22-3. Removal and detonation of UXO and TNT and RDX fragments complies with Military Munitions Rule and the Open Burning, Wastes Explosives provisions of RCRA. Treatment of the contaminated soils will comply with hazardous waste regulations; available analysis indicates the TNT and RDX contamination levels are less than 1% (10,000 ppm). Hence, the soils would not be RCRA-regulated. However, this will be confirmed during remediation. Removal of contamination and monitoring complies with the groundwater ARAR. Compliance with the emission control ARARs would be ensured by implementing air monitoring and dust suppression techniques during excavation. The DOD Standard 6055.9 "DoD Ammunition and Explosives Safety Standards," Chapter 2, "Real Property Contaminated with Ammunition, Explosives, or

Chemical Agents," would be met by implementing and enforcing applicable provisions of the standard. All areas affected by WAG 10 remedial activities would be evaluated for cultural resource concerns in consultation with the Shoshone-Bannock Tribes before disturbance. Activities in sensitive areas would be modified as required to meet ARARs. These alternatives therefore, are capable of complying with ARARs and TBCs.

22.2.1.3.3 Long-Term Effectiveness and Permanence—Alternatives 4a and 4b have a high potential for achieving long-term effectiveness and permanence because TNT and RDX contamination would be removed from WAG 10 and treated.

22.2.1.3.4 Reduction of Toxicity, Mobility, or Volume Through Treatment— Toxicity, mobility, and volume of contaminants would be reduced. Incineration and composting will destroy contamination in the soil, and detonation will destroy the TNT and RDX fragments.

22.2.1.3.5 Short-Term Effectiveness—The exposure risks to workers during excavation and removal of UXO, TNT and RDX fragments, and contaminated soil at WAG 10 sites could be significant. However, use of appropriate equipment and personal protective equipment, air monitoring, and dust control measures have been demonstrated to effectively mitigate risks in previous INEEL removal actions. Short-term effectiveness is, therefore, considered moderate. Worker exposures to soils contaminated with toxic and energetic materials would be inhibited using standard protective measures.

Table 22-3. Evaluation of compliance with ARARs and TBCs for WAG 10 TNT/RDX contaminated soil sites Alternative 4a: Removal, Off-Site Incineration and Disposal; and Alternative 4b: Removal, Ex Situ Composting, and Disposition on the INEEL.

ARAR or TBC	Type	Citation	Met Evaluation[a]
Idaho Groundwater Quality Rule	Chemical	IDAPA 58.01.11.200 Groundwater Quality Standards	Yes
Military Munitions Rule	Action	40 Code of Federal Regulations 266, Subpart M	Yes
Rules for Control of Air Pollution in Idaho	Action	IDAPA 58.01.01.650-.651, Fugitive Dust	Yes
Rules and Standards for Hazardous Waste in Idaho	Action	IDAPA 58.01.05.010.008, which incorporates RCRA by reference	Yes
Rules and Standards for Hazardous Waste in Idaho	Action	IDAPA 58.01.05.009 (40 Code of Federal Regulations 265.382)	Yes
Native American Graves Protection and Repatriation Act	Location	25 USC 32	Yes
National Historic Preservation Act	Location	36 Code of Federal Regulations 800	Yes
Real Property Contaminated with Munition, Explosives, or Chemical Agents	TBC	DoD Standard 6055.9, Chapter 12	Yes

a. A yes in the Met Evaluation column indicates that the alternative meets the ARAR or TBC.

Note: The table incorporates the assumption that all environmental siting, construction, and operation ARARs for the proposed INEEL CERCLA Disposal Facility (ICDF) will be identified and addressed in a separate document.

If mechanical excavation and screening equipment are used, the equipment would be modified to minimize potential for explosion and prevent injury to workers in the event of an explosion. Inhalation and ingestion risks caused by toxic compounds in soil could be minimized by use of appropriate personal protective equipment, engineering controls, and adherence to health and safety protocols.

On-Site treatment by composting will present some risk to workers and other occupants near the treatment site because of air emissions generated during the process. However, these emissions will be controlled by performing the treatment in a temporary building with an appropriate air emission control system.

In addition to risks caused by exposure to contaminants, risks associated with the physical construction hazards such as vehicle accidents or personal injury can be minimized by implementation of appropriate health and safety measures for earth-moving construction activities.

Environmental impacts resulting from Alternatives 4a and 4b would depend on the methods allowed for removal of TNT and RDX fragments and contaminated soil. Minimal impact would result if only manual excavation was used. Much larger areas would be disturbed if mechanical equipment is used for soil excavation and sorting to remove the TNT and RDX fragments. However, the impacts of these activities would be temporary, and the sites would be restored to match the surrounding landscape at the completion of the project. Sensitive cultural resources exist at WAG 10 contaminated soil sites of concern. Cultural resource surveys and Native American consultation would be conducted in advance of any disturbance in these areas. In the event that cultural resources are discovered, an assessment will be made of the effects of the remedial action on the resource and options to mitigate adverse impacts will be determined and evaluated. Appropriate actions will be taken to comply with ARARs that protect cultural resources.

The RAOs would be achieved by Alternatives 4a and 4b once excavation, treatment, and disposal or return to the excavation sites are complete.

The removal and treatment of soils from all WAG 10 soil sites of concern could be achieved in less than 12 months. However, the estimated time to prepare environmental assessments, safety analysis, and design phases, as well as performing the removal and verification sampling, is 12 to 18 months.

22.2.1.3.6 Implementability—Implementability is considered high for Alternatives 4a and moderate for Alternative 4b. While treatment objectives using off-Site incineration are sure to be satisfied, some treatability testing may be required to determine the optimal soil amendments and conditions in order for composting to achieve the required treatment standards.

22.2.1.3.7 Cost—The estimated costs for Alternatives 4a and 4b, $5.2 million and $5.1 million, respectively, are summarized in Table 21-1 and presented in detail in Appendix I. Costs are classified as moderate.

22.2.2 STF-02 Gun Range

22.2.2.1 Alternative 1: No Action. The no action alternative provides a baseline against which other alternatives can be compared. Under this alternative, existing management practices currently in place at the STF-02 Gun Range would be continued.

22.2.2.1.1 Overall Protection of Human Health and the Environment—Under the no action alternative, human health and environmental risks would not be mitigated. The absence of controls for the STF-02 Gun Range lead debris and contaminated soils results in no reduction of long-term risks;

there is no natural process that will render the lead nontoxic or hazardous. For purposes of this FS and to meet the intent of the NCP, we assume for the evaluation of the no action alternative that the site could become immediately accessible to the general public. The RAOs would not be met for the STF-02 Gun Range lead-contaminated soils under the no action alternative.

22.2.2.1.2 Compliance with ARARs and TBCs—The evaluation of the no action alternative for compliance with the ARARs and TBCs is presented in Table 22-4. None of the RCRA and IDAPA hazardous waste ARARs would be met for the STF-02 Gun Range, because RCRA characteristic waste would remain in place. Chemical-specific ARARs would not be met because impacts on groundwater quality are predicted.

22.2.2.1.3 Long-Term Effectiveness and Permanence—Alternative 1 does not provide long-term and permanent control of human and environmental exposure to the STF-02 Gun Range lead debris and contaminated soils. There are no measures to prevent release of contaminants from the site. Therefore, because potential releases of contaminants are not prevented, the long-term effectiveness and permanence of the no action alternative is considered low.

22.2.2.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment—No treatment is associated with Alternative 1. Toxicity, mobility, and volume of lead debris and soil would remain unchanged.

22.2.2.1.5 Short-Term Effectiveness—Alternative 1 can be implemented readily without additional risks to the community, workers, or the environment. No specialized equipment, personnel, or services are required to implement the no action alternative.

22.2.2.1.6 Cost—Estimated costs for the no action alternative, $3.3 million are summarized in Table 22-5 and presented in detail in Appendix I. Costs for 100 years of monitoring are included.

Table 22-4. Evaluation of compliance with ARARs and TBCs for the STF-02 Gun Range, Alternative 1: No Action.

ARAR or TBC	Type	Citation	Met Evaluation[a]
Rules and Standards for Hazardous Waste in Idaho	Action	IDAPA 58.01.05.010.006, .008, and .011, which incorporate RCRA by reference	No
Resource Conservation and Recovery Act	Action	40 Code of Federal Regulations 262.11, Hazardous Waste Determination 40 Code of Federal Regulations 264, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities 40 Code of Federal Regulations 268, Land Disposal Restrictions	No
Idaho Ground Water Quality Rule	Chemical	IDAPA 58.01.11.200, Groundwater Quality Standards	No

a. A yes in the Met Evaluation column indicates that the alternative meets the ARAR or TBC.

22.2.2.1.7 Implementability—No implementation concerns are associated with the no action alternative.

22.2.2.2 Alternatives 3a and 3b: Removal, Ex Situ Treatment, and Disposition. Actions common to Alternatives 3a and 3b consist of excavating and sorting the soil to remove metal fragments for recycle, removal, and on-Site disposal of nonhazardous debris, encapsulation and off-Site disposal of the railroad ties, and site restoration. The lead-contaminated soil would be sampled after separation of the metal fragments. If analysis indicates the soil is above PRGs and the RCRA TCLP for lead, then the soil would be treated by ex situ stabilization and disposed at an approved facility such as the CFA landfill (Alternative 3a) or treated by soil washing and returned to the STF-02 Gun Range Site (Alternative 3b). If the soil does not exceed the PRG and is also below the RCRA TCLP, then the soil will be returned to the site without treatment. If the soil exceeds the PRG and is not RCRA toxic for lead, then the soil will be disposed at an approved disposal facility such as the CFA landfill of the proposed ICDF.

22.2.2.2.1 Short-Term Effectiveness—The exposure risk to workers during excavation, screening, treatment, transport, and disposition of the soils and debris would be low because the chemical contamination levels are low. Short-term effectiveness is, therefore, considered high. Equipment operator and worker exposures would be minimized using established procedures.

22.2.2.2.2 Overall Protection of Human Health and the Environment—Alternatives 3a and 3b would provide highly effective, long-term protection of human health and the environment. Removal of the metal fragments would eliminate potential long-term risks from contaminant migration. Removal and treatment of contaminated soils would also eliminate risk from exposure and migration. Therefore, Alternatives 3a and 3b meet specified RAOs and provide for overall protection of human health and the environment.

22.2.2.2.3 Compliance with ARARs and TBCs—Table 22-5 presents the evaluation of Alternatives 3a and 3b for compliance with ARARs and TBCs. The removal of lead contamination will prevent contamination of groundwater, hence, the groundwater standards will be met.

The lead fragments recovered from the initial soil screening will be sent off-Site for recycle, if allowed by DOE policy, or encapsulated in accordance with RCRA regulations and disposed in a RCRA-compliant facility. Treatment of lead contaminated soil will be in compliance with RCRA requirements for hazardous waste treatment. Stabilized soil will meet RCRA land disposal restrictions for disposal (Alternative 3a). After soil washing, the soil will meet requirements for return to the excavation and the secondary waste will be treated to land disposal restrictions criteria and disposed in a RCRA-compliant facility. These actions will satisfy Idaho hazardous waste and RCRA ARARs.

Using air monitoring, dust suppression techniques, and air emission controls during excavation and treatment would ensure compliance with emissions ARARs. The site will be surveyed for cultural resources, and Native Americans will be consulted to identify appropriate actions needed to satisfy ARARs protection of sensitive resources. Alternatives 3a and 3b, therefore, are capable of satisfying all ARARs and TBCs.

22.2.2.2.4 Long-Term Effectiveness and Permanence—Alternatives 3a and 3b provide for long-term and permanent prevention of exposure to metal fragments and contaminated soil at the STF-02 Gun Range at WAG 10. Removal of the metal for recycle eliminates the greatest source of lead contamination from the site. The long-term risks associated with the soil contamination would be transferred from the STF Firing Range to the disposal facilities. The management practices for the facilities would ensure protection of human health and the environment. The long-term effectiveness and permanence of Alternatives 3a and 3b is considered high.

Table 22-5. Evaluation of ARARs and TBCs—for STF-02 Gun Range Alternatives 3a and 3b: Removal, Ex Situ Treatment, and Disposition.

ARAR or TBC	Type	Citation	Met Evaluation[a]
Idaho Groundwater Quality Rule	Chemical	IDAPA 58.01.11.200 Groundwater Quality Standards	Yes
Rules and Standards for Hazardous Waste in Idaho	Action	IDAPA 58.01.05.010.006, .008, and .011 which incorporate RCRA by reference	Yes
Resource Conservation and Recovery Act	Action	40 Code of Federal Regulation 261.6 – Requirements for Recyclable Materials	Yes
		40 Code of Federal Regulation 262.11—Hazardous Waste Determination 40 Code of Federal Regulations 264—Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities 40 Code of Federal Regulations 268—Land Disposal Restrictions	
Rules for Control of Air Pollution in Idaho	Action	IDAPA 58.01.01.650–.651—Fugitive Dust	Yes
		IDAPA 58.01.01.161—Toxic Substances	Yes
		IDAPA 58.01.01.500.2 – Requirements for Portable Equipment	Yes
		IDAPA 58.01.01.585 and .586—Toxic Air Emissions	Yes
National Emission Standards for Hazardous Air Pollutants	Action	40 Code of Federal Regulations 63.543-.545—National Emission Standards for Hazardous Air Pollutants from Secondary Lead Smelting	Yes
Native American Graves Protection and Repatriation Act	Location	25 USC 32	Yes
National Historic Preservation Act	Location	36 Code of Federal Regulations 800	Yes

a. A yes in the Met Evaluation column indicates that the alternative meets the ARAR or TBC.

22.2.2.2.5 Reduction of Toxicity, Mobility, or Volume Through Treatment—

Treatment by stabilization (Alternative 3a) would only reduce mobility of the lead contamination; toxicity would not be reduced and volume would be increased. Treatment by washing would also reduce mobility and volume but would not reduce toxicity.

Construction risks to workers also are a consideration during excavation, screening, treatment, packaging, storage, and disposition activities. These risks result primarily from physical construction hazards such as vehicle accidents or personnel injuries. However, implementation of appropriate health and safety measures for the excavation and treatment activities can minimize these risks.

Environmental impacts resulting from this alternative are expected to be minimal, because the site has been disturbed through previous activities. However, some sensitive cultural sites may exist near the

STF-02 Gun Range. Surveys will be conducted before any disturbance, and actions will be taken as necessary to comply with ARARs in the event resources are discovered during the surveys.

The RAOs would be achieved by this alternative once treatment was complete.

22.2.2.2.6 Implementability—Alternatives 3a and 3b are completely implementable. Methods to remove and sort soils at firing ranges for metal recycle are widely used. Metal recycle facilities are also available. Soil stabilization is a proven treatment technique, and there are many vendors who can perform this treatment. Soil washing to remove lead is less well demonstrated than stabilization. Therefore, treatability studies will be required to determine optimal treatment parameters. Facilities to dispose of the contaminated soil, treatment residues, and debris are presently operational and existing information indicates that the soils and debris would meet the acceptance criteria for these facilities.

22.2.2.2.7 Cost—The estimated costs for Alternatives 3a and 3b, $3.5 million and $8.1 million respectively, are summarized in Table 21-2 and presented in detail in Appendix I.

22.2.3 UXO Areas

22.2.3.1 Alternative 1: No Action. The no action alternative provides a baseline against which other alternatives can be compared. This alternative does not include environmental monitoring, because it is not applicable to UXO contamination. For this FS and to meet the intent of the NCP, we assume that under the no action alternative, the sites could become immediately accessible to the general public.

22.2.3.1.1 Overall Protection of Human Health and the Environment—Under the no action alternative, human health and ecological risks at WAG 10 UXO areas would be the same as those identified in the BRA (see Section 21.2). The absence of controls for UXO results in no reduction in risks. The RAOs would not be satisfied because risks to human and ecological receptors would not be reduced.

22.2.3.1.2 Compliance with ARARs and TBCs—The evaluation of the no action alternative for compliance with ARARs and with TBCs is presented in Table 22-6. The no action alternative does not implement any construction or operational activities that would result in disturbances to the surfaces of WAG 10 sites.

The no action alternative would not meet the DoD 6055.9-STD DoD Ammunition and Explosives Safety Standards, Chapter 12 "Real Property Contaminated with Ammunition, Explosives, or Chemical Agents," TBCs because no methods would be implemented to protect workers and members of the general public from exposure to hazards from potential UXO.

22.2.3.1.3 Reduction of Toxicity, Mobility, or Volume Through Treatment—No treatment is associated with this alternative.

Table 22-6. Evaluation of compliance with ARARs and TBCs for WAG 10 UXO Areas, Alternative 1: No Action.

ARAR or TBC	Type	Citation	Met Evaluation[a]
"Real Property Contaminated with Ammunition, Explosives, or Chemical Agents"	TBC	DoD Standard 6055.9, Chapter 12	No

a. A yes in the Met Evaluation column indicates that the alternative meets the ARAR or TBC.